REMARKS

Applicants thank the Examiner for carefully considering the subject application. Applicants respond to the issues under 35 U.S.C. § 103 raised by Office action mailed September 21, 2004 as follows.

I. Issues Under 35 U.S.C. §103

A. Claim 36

The Examiner has applied a combination of references under 35 U.S.C. §103(a) to claim 36. Specifically, the Examiner has applied Baron et al. (U.S. 4,401,052) in view of Kushiya et al. (U.S. 6,092,669).

Applicants believe it may be helpful to briefly review some background information from the specification and pending claim 36, as well as the basic combination of references asserted by the Examiner.

Specifically, the present application relates generally to the field of thin-film deposition and photovoltaics (PV). One example embodiment described in the specification focuses upon structure which is designed to deliver, into a thin-film layer-deposition zone in a deposition chamber, and by way of one or more flow-forming nozzles, a billowing plume (or plural plumes) of vapor derived from a suitable pool of molten deposition material, such as, in the case of PV-cell technology, copper, gallium, indium and/or selenium. This structure, in the particular PV-cell technology-field, functions in a multi-nozzle, cooperative, plume-generating array to generate a unique vaporous deposition fog which includes an appropriate co-mingled mix of the selected group of these just above-identified materials -- selected, of course, in accordance with the particular "form" of layer which is to be produced. This approach enables, in the context of producing a PV-cell device, employment of but a single, dedicated processing

chamber, and within that chamber, but a single, deposition-step "pass-through", to create a particular complex material layer in a (relatively) simple, economical, space-saving and technically satisfying, unified operation.

Claim 36, claims:

> A vapor deposition effusion system, comprising:
> a device configured to translate a strip material through a deposition zone and along a processing path, each of the strip material and the deposition zone having a width oriented perpendicular to the processing path and a length oriented parallel to the processing path; and
> first and second substantially closed vessels located serially along the processing path, each vessel containing a heated quantity of a different source material, the first and second vessels being configured to concurrently emit the different source materials and produce overlapping plumes of the different source materials in the deposition zone, each vessel including an array of vapor delivery nozzles distributed uniformly across the vessel in a direction corresponding to the width of the deposition zone and configured to expel overlapping plumes of source material, so that a fog of source materials is created and deposited on the strip material in the deposition zone, the fog having a substantially uniform composition across the width of the deposition zone and a varying composition across the length of the deposition zone.

Turning now to the Office action, it relies on Baron et al. as the primary reference, and supplements the lack of different source materials with Kushiya et al.

Applicants respectfully disagree with the rejection for the reasons previously stated in the last reply, which are incorporated herein by reference. However, to more clearly define claim 36, applicants have amended it to state that "the first and second vessels [are] configured to concurrently emit the different source materials and produce overlapping plumes of the different source materials in the deposition zone." As discussed below, none of the cited references show concurrent emission of different source materials to produce an overlapping plume in a deposition zone.

Specifically, Baron et al. cannot show concurrent emission of different source materials since the Office action admits it does not have different source materials. Likewise, there is nothing in Kushiya et al. which specifically discloses that different targets concurrently emit different source materials to produce overlapping plumes. The reference simply gives no teaching of such operation. In fact, the reference teaches away from overlapping plumes.

The Kushiya process involves sputtering which is fundamentally different from evaporation, as specified in the claims. In sputtering, the atom energy is one-to-two orders of magnitude higher than in evaporation. That high energy, combined with the fact that sputtering is done at a high pressure relative to thin-film deposition, causes high energy atoms to bounce erratically. As a result, atoms from one sputtering source (target) may collide with the adjacent deposition source, effectively poisoning the composition in that source. The poisoning results in a complete loss of control of target chemistry and subsequent loss of control of the final thin-film stoichiometry. This expectation was well-known in the sputter deposition industry by persons of ordinary skill in the art at the time of the invention.

To avoid the poisoning problem, when sputtering in a single chamber with multiple sputtering sources comprised of different materials, shields would be placed between adjacent sources. The shields act not as thermal barriers as with evaporation, but rather as line of sight blocking shields to prevent cross-contamination of adjacent sputtering sources, thus teaching away from comingling or overlapping different materials.

In contrast, with evaporation, the pressure is much lower and the mean free path is relatively large. In addition, the atom energy to release an atom from the surface of a molten pool of metal is one-to-two orders of magnitude less than that required to release an atom from a solid metal target in a sputtering process. As a result, the atoms statistical trajectory is toward the substrate and the atom does not have enough energy to bounce off and end up in the adjacent source. Therefore, with evaporation, cross-contamination of adjacent sources of deposition materials is avoided, line-of-sight shields are not required, and overlapping plumes may be created and controlled. It is unlikely that anyone of ordinary skill in the art would have compared or analogized side-to-side sputtering of different source materials to side-to-side evaporation of different source materials.

Even though there is no teaching or suggestion to combine Baron and Kushiya, if a person for some reason thought of attempting to combine the teachings, the person would not expect the combination to produce overlapping plumes of different material, because the system would include structure such as shields or walls to avoid overlap or co-mingling of different materials in accordance with accepted sputtering technology. As such, even if the references were combined, there is still no disclosure of concurrent emission of different source materials to produce an overlapping plume in a deposition zone.

B. Claim 66

Regarding claim 66, which also includes the limitations of claim 65 and 36, the rejection has applied a combination of Baron et al. (U.S. 4,401,052), Kushiya et al. (U.S. 6,092,669), Chow (U.S. 5,031,229), and Matsuda (U.S. 5,571,749).

Applicants respectfully submit that any combination utilizing the specialized configuration of Kushiya et al. geared to inflexible substrates cannot be applied to flexible substrates processed on rolls. The two are simply incompatible. As such, claim 66 should be allowed.

C. Claim 56

The Examiner has applied combinations of four references each under 35 U.S.C. §103(a) to claim 56. Specifically, the Examiner has applied Baron et al. (U.S. 4,401,052) in view of Kushiya et al. (U.S. 6,092,669), Chow (U.S. 5,031,229), and Matsuda et al. (U.S. 5,571,749).

Again, applicants disagree with the application of these references to the pending claims as described in the previous response, which is incorporated herein by reference. However, to more clearly define claim 36, applicants have amended it in a similar fashion as claim 36, and therefore respectfully submit that it should be allowed.

In addition, claim 56 includes a "roll assembly" that "is configured to maintain a substantially constant travel speed of the strip material through the deposition zone in relation to the temperature of source material in the crucible, such that source material of substantially uniform flux is created and deposited on the strip material."

Applicants have reviewed Matsuda et al., the only reference even alleged to show a roll assembly, and can find nothing that links a substantially constant speed of the strip material with the temperature of the source material. Rather, Matsuda et al.

draws a conclusion regarding the speed of the strip relative to the temperature change of the substrate. See, for example, col. 5, ll. 18-36 and col. 6, ll. 17-34.

D. Remaining Claims

While applicants believe that various assertions contained in the Office action with regard to the remaining claims are in error, in the interest of brevity, applicants believe that it is unnecessary to discuss them all at this time. Therefore, since the remaining claims depend from claims already discussed above, applicants respectfully request that the rejection of the remaining claims be withdrawn.

II. Conclusion

Applicants have made a genuine attempt to respond to the Office action. If there are any questions regarding this paper, or the application as a whole, the Examiner is encouraged to contact the undersigned attorney so that allowance of the claims can be facilitated.

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Mail Stop AMENDMENT, Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450 on March 31, 2005.

Pamela A. Knight
Date of Signature: March 31, 2005

Respectfully submitted,

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